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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/608,567	06/30/2000	Douglas M Carmean	042390.P8007	1457

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EXAMINER

TSAI, HENRY

ART UNIT	PAPER NUMBER
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2183

DATE MAILED: 12/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/608,567

Applicant(s)

CARMEAN ET AL.

Examiner

Henry W.H. Tsai

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 9/12/03.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 and 20-35 is/are rejected.
- 7) ☒ Claim(s) 19 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 12 September 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

Claim Objections

1. Claims 17-19 are objected to because of the following informalities:

in claim 17, line 2, "a detect" should read --detect a--;

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 11, 13, and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 11, the claim language is not consistent since it is unclear how a valid bit used for the dependent instruction can also be used to indicate that the instruction is invalid. How to define the dependent instruction is valid or invalid was not defined previously.

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In claim 33, it is unclear what is meant by "data representing a plurality of mask layers string physical data representing the presence or absence of material at various locations of each of said plurality of mask layers" since how mask layers string physical data can represent the presence or absence of material at various locations of each of said plurality of mask layers ? The mask layers can not represent the presence or absence of material at various locations of each of said plurality of itself. What is the "material" at various locations ? Is it a data or bit or others ?

Applicant is required to review the claims and correct all language which does not comply with 35 U.S.C. § 112, second paragraph.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

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5. Claims 1-17, 20-32, 34 and 35 are rejected under 35

U.S.C. 102(a) as being anticipated by Grochowski (US Patent No. 6,047,370), herein referred as Grochowski.

Referring to claim 1, Grochowski disclosed, as claimed, an apparatus comprising: an execution unit (processor pipeline 10, see Fig. 2) to execute an instruction; a replay system (comprising queue 15 and channel 17, see Fig. 2) to replay an altered instruction formed from changing said original instruction (see Col. 7, lines 30-34, regarding "the problem can be identified and corrected in the queue 15 and the execution stream replayed") if the execution unit executes the instruction erroneously (see Col. 7, lines 9-13, for the exemplary problems, and Col. 7, lines 25-29, for how the altered instruction to be formed from changing said original instruction).

Referring to claim 20, Grochowski disclosed, as claimed, a processor (comprising processor pipeline 10, see Fig. 2) comprising: a scheduler (inherently existing in the processor comprising processor pipeline 10, see Fig. 2) to dispatch an original instruction (through the processor pipeline 10, see Fig. 2); an execution unit (inherently existing in the processor comprising processor pipeline 10, see Fig. 2) to attempt execution of the original instruction; a checker (inherently

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existing, see Col. 7, lines 45-46, regarding instructions being checked contain a problem and needed to be replayed) to determine whether the original instruction executed properly; a replay system (comprising queue 15 and channel 17, see Fig. 2) comprising: a replay loop to replay the original instruction (see Col. 7, lines 30-34, regarding "the problem can be identified and corrected in the queue 15 and the execution stream replayed); a morphing circuit to change the original instruction into an altered instruction and to replay the altered instruction (see Col. 7, lines 9-13, for the exemplary problems, and Col. 7, lines 25-29, for how the altered instruction to be formed from changing said original instruction).

Referring to claim 24, Grochowski disclosed, as claimed, a method comprising: executing an original instruction (the instructions entering the Grochowski's system from front end 12, see Fig. 2); determining if a first (in the Grochowski's system when the instruction has new problem, see Col. 7, lines 55-64) occurs; if said first condition occurs, then morphing said original instruction to form a morphed instruction; and executing said morphed instruction (see Col. 7, lines 9-13, for the exemplary problems, and Col. 7, lines 25-29, for how the

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morphed instruction to be formed from said original instruction).

Referring to claim 29, Grochowski disclosed, as claimed, an article comprising a machine readable medium that stores data (inherently the data stored in the main memory of the processor comprising processor pipeline 10, see Fig. 2) representing an integrated circuit comprising: an execution unit (inherently existing in the processor comprising processor pipeline 10, see Fig. 2) to execute an instruction; a replay system (comprising queue 15 and channel 17, see Fig. 2) to replay an altered instruction if the execution unit executes the instruction erroneously (see Col. 7, lines 9-13, for the exemplary problems, and Col. 7, lines 25-29, for how the altered instruction to be formed from changing said original instruction).

Referring to claim 34, Grochowski disclosed, as claimed, an article comprising a machine readable carrier medium having stored thereon data (inherently the data stored in the main memory of the processor comprising processor pipeline 10, see Fig. 2) which, when loaded into a computer system memory in conjunction with simulation routines, provides functionality of a model comprising: an execution unit (inherently existing in the processor comprising processor pipeline 10, see Fig. 2) to execute an instruction; a replay system (comprising queue 15 and

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channel 17, see Fig. 2) to replay an altered instruction if the execution unit executes the instruction erroneously (see Col. 7, lines 9-13, for the exemplary problems, and Col. 7, lines 25-29, for how the altered instruction to be formed from changing said original instruction).

As to claims 2, 21, 30, and 35, Grochowski also discloses the replay system comprises: a replay loop (through channel 17, see Fig. 2) to replay the instruction under a first condition (in the Grochowski's system when the instruction has an initial problem, see Col. 7, lines 55-64); and an instruction morphing circuit to replay the altered instruction under a second condition (in the Grochowski's system when the instruction has new problem, see Col. 7, lines 55-64).

As to claims 3 and 22, Grochowski also discloses: the replay system comprises: a replay loop (through channel 17, see Fig. 2) to replay the instruction if the instruction is a first instruction condition (in the Grochowski's system when the instruction has an initial problem, see Col. 7, lines 55-64); and an instruction morphing circuit to replay the altered instruction if the instruction is a second instruction condition (in the Grochowski's system when the instruction has an initial problem, see Col. 7, lines 55-64; see also Col. 7, lines 30-34,

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regarding "the problem can be identified and corrected in the queue 15 and the execution stream replayed).

As to claims 4 and 23, Grochowski also discloses: the first instruction is one of a plurality of non-modifiable instructions (note inherently, the Grochowski's non-modifiable instructions are different from the modifiable instructions thereof and can be classified as the first and second instruction respectively) and the second instruction is one of a plurality of modifiable instructions.

As to claim 5, Grochowski also discloses: the plurality of modifiable instructions are morphed only if a failure in their initial execution occurs (see Col. 7, lines 30-34, regarding "the problem can be identified and corrected in the queue 15 and the execution stream replayed).

As to claim 6, Grochowski also discloses: replay system tracks at least one extra bit (mask bit indicated within Col. 7, lines 43-46) to allow alterations of instructions.

As to claims 7 and 27, Grochowski also discloses: said apparatus comprises a low level cache and a higher level cache (inherently existing in systems such as Grochowski's system), wherein the replay system is to alter a load instruction that has already missed (see col. 7, line 9 for the cache miss situation and lines 17-18 for the memory access problem) in the

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higher level cache to thereafter only access the low level cache.

As to claims 8 and 28, Grochowski also discloses: said apparatus comprises a page miss handler (inherently existing) to handle instructions that cause page faults (see Col. 7, lines 11-12, regarding the page fault problem), wherein the instruction is a memory access that causes a page fault, and wherein the replay system is to change the memory access to one or more memory accesses (see col. 7, lines 17-18 regarding the memory access problem) to handle the page fault (note this is inherently existing in the Grochowski's system since the Grochowski's system only replays the back end 14 rather than stalls or replays the entire pipeline 10, see Col. 8, lines 1-3).

As to claim 9, Grochowski also discloses: the replay system is to replace the memory access with a page descriptor read, then to replace said page descriptor read with a page table entry read, then to reinstate the memory access (note this is inherently existing in the Grochowski's system since the Grochowski's system use the reply system to handle the memory access problems, see col. 7, lines 17-18 regarding the memory access problem).

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As to claim 10, Grochowski also discloses: said instruction is a dependent instruction that is dependent on a result from a previous instruction, and wherein the replay system is to alter the dependent instruction to avoid execution in further iterations through the replay system until the previous instruction has successfully executed (see Col. 7, lines 55-67, regarding "the each **iteration** of the back end 14 progresses toward retirement of the instructions from which the micro-ops were generated. Techniques for predicting control **and data dependencies** are sophisticated and sufficiently accurate that the replay is the exception rather than the rule").

As to claim 11, Grochowski also discloses, as best understood: the replay system is to alter the dependent instruction by setting a valid bit (mask bit indicated within Col. 7, lines 43-46) for the dependent instruction to indicate that the instruction is invalid.

As to claim 12, Grochowski also discloses: the replay system is to alter the dependent instruction back into an executable form when said previous instruction retires (see Col. 7, lines 55-67, regarding "the each **iteration** of the back end 14 progresses toward retirement of the instructions from which the micro-ops were generated. Techniques for predicting control **and**

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data dependencies are sophisticated and sufficiently accurate that the replay is the exception rather than the rule").

As to claim 13, Grochowski also discloses, as best understood: the replay system is to reset the valid bit when any instruction retires (see Col. 7, lines 55-67, regarding "the each iteration of the back end 14 progresses toward retirement of the instructions from which the micro-ops were generated").

As to claim 14, Grochowski also discloses: the replay system is to track a sequence number for the previous instruction and wherein the replay system is to return the dependent instruction to an executable form when said previous instruction completes (see Col. 7, lines 55-67, regarding "the each iteration of the back end 14 progresses toward retirement of the instructions from which the micro-ops were generated. Techniques for predicting control and data dependencies are sophisticated and sufficiently accurate that the replay is the exception rather than the rule").

As to claim 15, Grochowski also discloses: the apparatus further includes a cache, and wherein the replay system is to return the dependent instruction to an executable form when a write to the cache occurs (inherently existing in systems such as Grochowski's system; see also col. 7, line 9 for the cache miss situation).

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As to claim 16, Grochowski also discloses: instruction is a high precision instruction and said replay system is to generate a first result and then the altered instruction is to be executed to generate a final result from the first result (note as shown in Col. 7, lines 29-30, the queue 15 has stored the intermediate state of the pipeline 10).

As to claim 17, Grochowski also discloses: said execution unit is a numeric execution unit and wherein said replay system is to a detect data dependent condition for the instruction and to provide the altered instruction to achieve an identical result (see Col. 7, lines 55-67, regarding "the each iteration of the back end 14 progresses toward retirement of the instructions from which the micro-ops were generated. Techniques for predicting control and data dependencies are sophisticated and sufficiently accurate that the replay is the exception rather than the rule").

As to claim 25, Grochowski also discloses: determining if the first condition occurs further comprises: determining whether the original instruction executed improperly (see Col. 7, lines 30-34, regarding "the problem can be identified and corrected in the queue 15 and the execution stream replayed).

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As to claim 26, Grochowski also discloses: determining whether a second condition (in the Grochowski's system when the instruction has an initial problem, see Col. 7, lines 55-64) occurs; if said second condition occurs, then replaying said original instruction for execution.

As to claim 31, Grochowski also discloses: the data representing the integrated circuit comprises a functional description of the integrated circuit (inherently existing in the systems such as Grochowski's system since it comprises functions units.

As to claim 32, Grochowski also discloses: the data representing the integrated circuit comprises a hardware description language code (inherently existing in the systems such as Grochowski's system since it comprises functions units.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claims 18 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grochowski.

Grochowski discloses the claimed invention except for: the instruction is a rounding instruction and the altered instruction is an add instruction (claim 18); and the data representing the integrated circuit comprises data representing a plurality of mask layers string physical data representing the presence or absence of material at various locations of each of said plurality of mask layers (claim 33).

However, the situation when instruction is a rounding instruction and the altered instruction is an add instruction is well known in the art in order to effectively use the hardware and software resources.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Grochowski's system to comprise the original instruction being a rounding instruction and the altered instruction being an add instruction in order to effectively and flexibly use the hardware and software resources.

Further, using mask layers string physical data to represent the presence or absence of material at various locations is well known in the art in a data processing.

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It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Grochowski's system to comprise the data representing the integrated circuit comprising data representing a plurality of mask layers string physical data representing the presence or absence of material at various locations of each of said plurality of mask layers in order to facilitate the data processing for the Grochowski's system.

Allowable Subject Matter

8. Claim 19 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: Grochowski (US Patent No. 6,047,370), the closest reference, and the other cited prior art do not teach or fairly suggest: the numeric execution unit lacks hardware to compute one or more relatively rare numeric cases and wherein such relatively rare numeric cases are instead implemented by injecting, via the replay system, the

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altered instruction to achieve an effectively identical result
(in claim 19).

Response to Arguments

10. Applicant's amendments mailed 9/12/03 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.


Contact Information

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Henry Tsai whose telephone number is (703) 308-7600. The examiner can normally be reached on Monday-Thursday from 8:00 AM to 5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner supervisor, Eddie Chan, can be reached on (703) 305-9712. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 2100 receptionist whose telephone number is (703) 305-3900.

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13. In order to reduce pendency and avoid potential delays, Group 2100 is encouraging FAXing of responses to Office actions directly into the Group at fax number: 703-872-9306.

This practice may be used for filing papers not requiring a fee. It may also be used for filing papers which require a fee by applicants who authorize charges to a PTO deposit account. Please identify the examiner and art unit at the top of your cover sheet. Papers submitted via FAX into Group 2100 will be promptly forward to the examiner.



HENRY W. H. TSAI
PRIMARY EXAMINER

December 15, 2003